

## Syllabus for Math 70220, Lie groups

BRIAN C. HALL

Spring 2018

### 1. SCHEDULE

The course is scheduled for MWF, 3:00-3:50.

### 2. SYLLABUS

Lie groups are “continuous groups,” that is, groups whose elements are described by one or more continuous real parameters. Most of the interesting examples are groups of matrices, such as the group of rotations in three dimensions. In applications, such groups describe symmetries of problems in physics or mathematics.

The course will cover portions of the first two parts of the second edition of my book on Lie groups. The first part discusses general results about Lie groups and Lie algebras from the point of view of matrix groups. This approach will allow us to get going quickly with a minimum of prerequisites. In particular, knowledge of manifold theory is not necessary. The main prerequisite is a solid background in linear algebra, including eigenvectors and diagonalization. I intend to go through this first part of the book quickly, taking no more than half the semester.

The second part of the book (and the course) will be on semisimple Lie algebras. This is your opportunity to learn about root systems, the Weyl group, Dynkin diagrams, and all that! This is very useful material, but also difficult to absorb the first time you see it. We will ease into the subject gradually by examining the case of the group  $SU(3)$  in detail before launching into the general theory.

### 3. TEXT

I will be working from the second edition of my book, “Lie groups, Lie algebras, and representations: An elementary introduction.” Our library provides free electronic access to a PDF of the book. To find this, start out *on the campus network* and then search for my book on Springer’s web site, or use this link:

<http://www.springer.com/us/book/9783319134666>

You should see a green bar at the top of the page saying, “Access this title on Springer-Link. Click here.” Clicking will take you to another page where you can download a PDF of the book. On the SpringerLink page, there is also a button that allows you to purchase a paperback copy of the book for \$25. Of course, you can also purchase a hardback copy of the book from Amazon.com.

### 4. GRADING

There will be graded homework assignments approximately every other week. There will be no formal final exam, just a final homework assignment.